

## 2027 IPCC Methodology Report on Inventories for Short-lived Climate Forcers

### Background

1. At the 49<sup>th</sup> Session (IPCC-49) held in May 2019 (in Kyoto, Japan) the IPCC approved the Task Force on National Greenhouse Gas Inventories (TFI) to produce an IPCC Methodology Report on SLCFs following the Appendix A to the Principles Governing IPCC Work (Decision IPCC-XLIX-7).
2. IPCC TFI carried out preparatory work including Expert Meetings<sup>1</sup> during the AR6 cycle. The Scoping Meeting produced the draft Table of Contents, which is outlined in Annex 2.

### Scope

3. The new Methodology Report will provide guidance on SLCF emissions which are:
  - Anthropogenic, not including secondary human-induced substances
  - National
  - Annual
  - Reported in mass units for each individual emitted species.
4. Coverage:
  - Taking into account that this work aims to cover all IPCC inventory sectors with categories where the science is assessed to be robust enough to provide guidance for a Tier 1 methodological approach and have a relative contribution to the global/regional emissions of the species, species<sup>2</sup> assessed and potentially covered by the new Methodology Report will be NO<sub>x</sub>, CO, NMVOCs, SO<sub>2</sub>, NH<sub>3</sub>, BC and OC, as well as emissions of primary particulate matter relevant for radiative forcing, as appropriate.
  - Methane and halogenated species under Montreal Protocol and Kigali Amendment will not be covered since these are already addressed by the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (*2006 IPCC Guidelines*), the 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands (*Wetlands Supplement*) and the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (*2019 Refinement*).
  - For NMVOCs, the methodology should provide estimates for total NMVOCs. The speciation of NMVOCs should be considered by authors, as appropriate.
  - Anthropogenic emissions<sup>3</sup> only, where anthropogenic refers to emissions from human activities and from managed<sup>4</sup> land.
  - Sources covered are those of anthropogenic emissions, where scientific evidence is available; while for others, guidance could be provided as a basis for future methodological development.
  - Geographical and temporal coverage is national and annual level, and authors should also consider guidance on spatial and temporal disaggregation of SLCF emissions.
5. Key elements:
  - Structure: Information on each sector will be synthesised into a single document (a volume for each of the inventory sectors: Energy, Industrial Process and Product Use (IPPU), Agriculture, Forestry and Other Land Use (AFOLU), Waste. There will also be a volume on cross-cutting issues, including reporting tables).
  - Content of cross-cutting guidance: The volume for cross-cutting issues will include: introduction<sup>5</sup>, with guidance on SLCF species and definitions, approaches to data collection<sup>6</sup>; uncertainties; methodological choice and identification of key categories; time series consistency; quality assurance/quality control (QA/QC) and verification; and reporting guidance and tables.
  - Content of sectoral guidance: The volumes for each sector will include tiered methodological approaches; decision trees; methods and emission factors, where appropriate; cross-references

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<sup>1</sup> The Joint 1<sup>st</sup> and 2<sup>nd</sup> IPCC Expert Meeting on SLCFs: [https://www.ipcc-nggip.iges.or.jp/public/mtdocs/2110\\_SLCF.html](https://www.ipcc-nggip.iges.or.jp/public/mtdocs/2110_SLCF.html)

The 3<sup>rd</sup> IPCC Expert Meeting on SLCFs: [https://www.ipcc-nggip.iges.or.jp/public/mtdocs/2204\\_SLCF\\_EM3.html](https://www.ipcc-nggip.iges.or.jp/public/mtdocs/2204_SLCF_EM3.html)

<sup>2</sup> Given the uncertainties in the radiative forcing of H<sub>2</sub> and taking note that H<sub>2</sub> has not yet been well assessed as a climate forcer by IPCC WGI, H<sub>2</sub> emissions relevant for radiative forcing are to be considered by the authors as an Appendix subtitled “Basis for future methodological development” subject to the IPCC’s Principles and Procedures on review and adoption.

<sup>3</sup> as defined in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (*2006 IPCC Guidelines*), the 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands (*Wetlands Supplement*) and the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (*2019 Refinement*).

<sup>4</sup> land where human interventions and practices have been applied to perform production, ecological or social functions.

<sup>5</sup> considering the importance for climate effects of spatial distribution and temporal resolution of SLCF emissions, and changes in co-emitted species

<sup>6</sup> including generic methods of measurements, approaches to estimate BC/OC, including on techniques of measurement and all variables used to derive emission factors, NMVOC speciation, spatial distribution and temporal resolution, technology, and abatement information.

as necessary to avoid double counting or omissions of emissions; sector-specific guidance on uncertainty assessment and QA/QC; and reporting and documentation guidance.

## Approach

6. The result of the work will be an IPCC Methodology Report “2027 IPCC Methodology Report on Inventories for Short-lived Climate Forcers” .
7. The authors will ensure consistency with categories and build on the methodological guidance within the *2006 IPCC Guidelines, Wetlands Supplement* and *2019 Refinement*.
8. The authors will follow “Instructions to Experts and Authors” presented in Annex 3 to ensure a consistent and coherent approach across all the volumes and chapters, including the use of common terminology.
9. Importantly, the authors will provide guidance based on the *good practice*<sup>7</sup> guidance definition and the structured tiered approach described in the *2006 IPCC Guidelines, Wetlands Supplement* and *2019 Refinement*.
10. The production of the Methodology Report will be completed in 2027 as noted in the work plan in Annex 4 following Decision IPCC-LX-9.

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<sup>7</sup> *“Good practice” is a key concept for inventory compilers to follow in preparing national greenhouse gas inventories. The key concept does not change in the 2019 Refinement. The term “good practice” has been defined, since 2000 when this concept was introduced, as “a set of procedures intended to ensure that greenhouse gas inventories are accurate in the sense that they are systematically neither over- nor underestimates so far as can be judged, and that uncertainties are reduced so far as practicable”. This definition has gained general acceptance amongst countries as the basis for inventory development and its centrality has been retained for the 2019 Refinement. Certain terms in the definition have been updated based on feedback from the statistics community, such that this definition can be also understood as “a set of procedures intended to ensure that greenhouse gas inventories are accurate in the sense that they are systematically neither over- nor underestimates so far as can be judged, and that they are precise so far as practicable” in the context of refinement of Chapter 3 of Volume 1. Good Practice covers choice of estimation methods appropriate to national circumstances, quality assurance and quality control at the national level, quantification of uncertainties and data archiving and reporting to promote transparency.*

## 2027 IPCC Methodology Report on Inventories for Short-lived Climate Forcers

### Overview

#### Volume 1. General Guidance

- *Introduction*  
(including, but not limited to: Background on SLCFs and their importance for climate, Key differences between SLCFs and GHGs emissions, Holistic approaches to SLCFs and the importance of co-emitted species, Spatial distribution and temporal resolution and relevance to climate effects, Interlinkages with meteorology, Importance of technologies and abatement technologies)
- *Approaches to Data Collection*  
(including, but not limited to: Spatial distribution and temporal resolution, Measurement techniques, NMVOC speciation, Technologies and Abatement technologies)
- *Uncertainties*
- *Methodological Choice and Identification of Key Categories*  
(including, but not limited to KCA by SLCF species, Issues of co-emitted species in SLCF KCA)
- *Timeseries consistency*  
(including, but not limited to: Addressing changes in measurement techniques, Addressing changes in technologies, including for abatement)
- *QA/QC and Verification*  
(including, but not limited to: Consistency with co-emitted GHGs and SLCFs, Comparison with global/regional inventories, Comparisons with atmospheric observations and models)
- *Reporting guidance and Tables*

#### Volume 2. Energy Sector

- *Introduction*
- *Stationary combustion*
- *Mobile combustion*
- *Fugitive Emissions*
- *Other*

#### Volume 3. IPPU Sector

- *Introduction*
- *Mineral Industry*
- *Chemical Industry*
- *Metal Industry*
- *Non-Energy products from fuels and Solvent Use*
- *Other*

#### Volume 4. AFOLU Sector

- *Introduction*
- *Generic methodologies*
- *Consistent representation of land*
- *Emissions from Livestock and Manure Management*
- *Land use categories*
- *Managed soil<sup>8</sup>*
- *Other*

#### Volume 5. Waste Sector

- *Introduction*
- *Solid Waste Disposal*
- *Biological Treatment of Solid Waste*
- *Incineration and Open Burning of Waste*
- *Wastewater Treatment and Discharge*
- *Other*

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<sup>8</sup> As expanded by the Wetlands Supplement guidance/categorization

## 2027 IPCC Methodology Report on Inventories for Short-lived Climate Forcers

1. Work on a 2027 IPCC Methodology Report on Inventories for Short-lived Climate Forcers will be guided by the IPCC procedures for the Preparation, Review, Acceptance, Adoption, Approval and Publication of the IPCC Reports (Appendix A to the Principles Governing the IPCC Work<sup>9</sup>). This document is consistent with the IPCC procedures and applies to all experts engaged in the production of a new Methodology Report.
2. In this document the term “experts” covers Co-Chairs, members of the TFI Bureau (TFB), technical support unit (TSU) Staff, Coordinating Lead Authors (CLAs), Lead Authors (LAs), and Review Editors (REs) as well as Contributing Authors (CAs) and Expert Reviewers.
3. These notes are intended as guidance to experts contributing to a new Methodology Report. They are intended to ensure a consistent and coherent approach across all the volumes or chapters and to promote common terms used.

### Confidentiality

4. Authors meetings are closed meetings. Any discussions are confidential except for any published report of the meeting. This is to ensure that experts participating in the meetings can express themselves and discuss issues freely and openly.
5. The IPCC considers the drafts of a new Methodology Report, prior to acceptance, to be pre-decisional, provided in confidence to reviewers, and not for public distribution, quotation or citation.
6. The TSU will keep drafts of a new Methodology Report sent for the IPCC review, any comments received on them and the responses by authors. All written expert and government review comments will be made available to reviewers on request. These will be made available on the IPCC website as soon as possible after the acceptance by the Panel and the finalisation of the report.

### Conflict of Interest

7. It is important that all experts involved in the IPCC activities avoid any conflict of interest or the direct and substantial appearance of a conflict of interest. It is recognised that many experts in Emission Inventories are employed by, or funded by, parties with some interest in the outcome (e.g. most inventory compilers are funded by national governments or industry). It is therefore important to be open and transparent about financial and other interests.
8. The IPCC implements a Conflict of Interest (COI) Policy<sup>10</sup> that applies to all individuals directly involved in the preparation of IPCC reports, including senior IPCC leadership (IPCC Chair and Vice-Chairs), other Bureau and Task Force Bureau members, authors with responsibilities for report content (CLAs, LAs), Review Editors and staff of the TSU. The overall purpose of this policy is to protect the legitimacy, integrity, trust, and credibility of the IPCC and of those directly involved in the preparation of reports, and its activities.
9. Before an individual is appointed as a CLA, LA and RE for a new Methodology Report, the TFB will request the individual to complete a Conflict of Interest Disclosure Form (“the COI Form”) contained in Annex B to the COI Policy which will be submitted to the TSU. The TFB will then evaluate the form to determine whether the individual has a conflict of interest that cannot be resolved.
10. All CLAs, LAs and REs will inform the TSU annually of any changes in the information provided in their previously submitted COI Form. The TFB will evaluate the revised information.
11. All COI Forms and any records of the deliberations of the COI Expert Advisory Group, deliberations and/or decisions of the COI Committee in relation to conflict of interest issues in respect of specific individuals and any information disclosed by individuals for the purposes of the COI Policy will be transferred to the Secretariat after they have been reviewed and will be securely archived by the Secretariat and retained for a period of five years after the end of the assessment cycle during which the relevant individual contributed, after which the information will be destroyed. Subject to requirement to notify the existence of a conflict of interest to others, the information referred to above will be considered confidential and will not be used for any purpose other than consideration of conflict of interest issues under these Implementation Procedures without the express consent of the individual providing the information.

### Responsibilities of authors and other experts

12. The role of authors is to impartially assess ALL the available literature and to describe the best

<sup>9</sup> <https://www.ipcc.ch/site/assets/uploads/2018/09/ipcc-principles-appendix-a-final.pdf>

<sup>10</sup> <https://www.ipcc.ch/site/assets/uploads/2018/09/ipcc-conflict-of-interest-2016.pdf>

methodologies available. Experts should be impartial. Authors should review all literature available up to a cut-off date to be decided by the TFB as part of the agreed work plan.

13. After drafting the report authors will be asked to consider all comments received on the drafts and to adjust and revise the text accordingly. They should document their responses. If they do not accept a comment this should be explained. Review Editors should check whether the accepted changes were fully incorporated in the revised text.
14. Responsibilities and duties of authors and other experts are currently explained in more detail in the IPCC procedures for the Preparation, Review, Acceptance, Adoption, Approval and Publication of the IPCC Reports (Appendix A to the Principles Governing the IPCC Work).

#### Literature

15. The use of literature should be open and transparent. In the drafting process, emphasis is to be placed on the assurance of the quality of all cited literature. Priority should be given to peer-reviewed scientific, technical and socio-economic literature if available.
16. It is recognized that other sources provide crucial information for IPCC Reports. These sources may include reports from governments, industry, and research institutions, international and other organizations, or conference proceedings. Use of this literature brings with it an extra responsibility for the author teams to ensure the quality and validity of cited sources and information as well as providing an electronic copy. In general, newspapers and magazines are not valid sources of scientific information. Blogs, social networking sites, and broadcast media are not acceptable sources of information for IPCC Reports. Personal communications of scientific results are also not acceptable sources.
17. For any sources written in a language other than English, an executive summary or abstract in English is required.
18. All sources will be integrated into a reference section of an IPCC Report.
19. For more details of the procedure on the use and referencing of literature in IPCC Reports, see Annex 2 to the IPCC procedures for the Preparation, Review, Acceptance, Adoption, Approval and Publication of the IPCC Reports (Appendix A to the Principles Governing the IPCC Work).

#### Principles of the new Methodology Report

20. Guidance in the new Methodology Report should be understandable and easy to implement. Lead authors should make efforts to balance the need to produce a comprehensive self-contained report with reasonable limits to the length and detail of the guidance. In particular:
  - a. The guidance should follow a cookbook approach by providing clear step by step instructions. It should not try to be a textbook. Detailed background information on emission processes, scientific studies, etc. is generally referenced rather than included.
  - b. Lead authors must consider relevant scientific developments and national methods used by countries in their inventories.
  - c. Authors should bear in mind that the target audience is a diverse group of readers who are primarily concerned with the elaboration of national inventories. For this reason, the emphasis should be on ensuring clear communication of practical and understandable guidance.
21. This work aims to cover all IPCC inventory sectors with categories where the science is considered to be robust enough to provide guidance for a Tier 1 methodological approach and have a relative<sup>11</sup> contribution to the global/regional emissions of the species, using the significance and prioritization criteria as shown below.

##### Significance and prioritization criteria

- Significance of the category and the species within the sector on a global/regional scale. Categories significant only for a limited number of particular countries, currently or in the foreseeable future, may not meet this criterion.
- Sufficient data availability and maturity of scientific advances to provide a basis for methodological development, including:
  - Ability to develop default emission factors and parameters
  - Feasibility of obtaining the necessary data to implement the methods

22. The general structure, approach and definitions used in the *2006 IPCC Guidelines*, such as tiered approach and decision trees will be followed. Annexes may be used where necessary to contain additional data to support the methodologies, although large numbers of annexes will probably not be necessary. Appendices are not ruled out where scientific knowledge is insufficient for countries to agree

<sup>11</sup> i.e. not insignificant

full methodologies, but please avoid as far as possible work on areas that have to be relegated to an appendix. Appendices should be sub-titled by “Basis for future methodological development”.

## Definitions

23. The following terms will be used throughout the new Methodology Report, and it is essential that all Lead Authors have a common understanding of their meaning and relevance.
24. **Tier** A Tier refers to a description of the overall complexity of a methodology and its data requirements. Higher tier methods are generally more complex and data-intensive than lower tier methods. The guidance for each category should contain at least a Tier 1 method, and in many cases there will be a Tier 2 and Tier 3. The general expectation is that Tier 2 and Tier 3 methods will both be consistent with *good practice* guidance for key sources, although in some cases Tier 3 will be preferred.
25. **Tier 1** approaches are simple methods that can be applied by all countries in all circumstances. Default values for the emission factors and any other parameters needed must be supplied (see below for documentation needed).
26. **Tier 2** methods should in principle follow the same methodological approach as Tier 1 but allow for higher resolution country specific emissions factors and activity data. In some categories, this may not be the case. These methods should better replicate the parameters affecting the emissions. Country specific emission factors are needed and possibly more parameters will also be needed.
27. **Tier 3** methods give flexibility either for country specific methods including modelling or direct measurement approaches, or for a higher level of disaggregation, or both. This is a more complex method, often involving a model. This will replicate many features of nation emissions and require specific parameters for each country.
28. **Default information** is data that is appropriate for use where there is no better detailed, country specific information. If appropriate, authors may specify regional default data. Users of the guidelines should be encouraged to try to find better country specific data. Default data are appropriate for Tier 1 methods and the guidelines should contain all the default values needed. Emission factors for higher tiers need not be specified because it is a function of higher tier methods to find data reflecting national circumstances. Default information is included primarily to provide users with a starting point from which they can develop their own national assumptions and data. Indeed, national assumptions and data are always preferred because the default assumptions and data may not always be appropriate for specific national contexts. In general, therefore, default assumptions and data should be used only when national assumptions and data are not available.
29. **Decision Trees**. A decision tree is a graphical tool to assist countries in selecting from the IPCC methods.
30. **Key categories** are inventory categories which individually, or as a group of categories (for which a common method, emission factor and activity data are applied) are prioritised within the national inventory system because their estimates have a significant influence on a country's total inventory in terms of the absolute level, the trend, or the level of uncertainty in emissions. Key category analysis should be performed species by species. The appropriate threshold to define key categories should be considered by authors.
31. **Sector** refers to the four sectors of the guidelines (Energy; Industrial Process and Product Use (IPPU); Agriculture, Forests and Other Land Use (AFOLU) and Waste) these are divided into categories and subcategories.
  - a. Sector 1
  - b. Category 1.A
  - c. Sub-category 1st order 1.A.1
  - d. Sub-category 2nd order 1.A.1.a
  - e. Sub-category 3rd order, 1.A.1.a.i
32. **Worksheets**. These will be printed versions of spreadsheet tables, that, when filled in, enable the user to perform the emission estimation. They should contain all the calculations and written text with any formulae. Additional worksheets may be required to compile the results of the worksheets into the reporting tables.
33. **Reporting Tables** are tables that present the calculated emission inventory and sufficient detail of other data used to prepare the inventories for others to understand the emission estimates.
34. Usage:
  - a. **“Good Practice”** is defined in the *2019 Refinement* as follows: “a key concept for inventory compilers to follow in preparing national greenhouse gas inventories. The key concept does not change in the 2019 Refinement. The term "good practice" has been defined, since 2000 when this concept was introduced, as "a set of procedures intended to ensure that greenhouse gas inventories are accurate in the sense that they are systematically neither over- nor underestimates

so far as can be judged, and that uncertainties are reduced so far as practicable". This definition has gained general acceptance amongst countries as the basis for inventory development and its centrality has been retained for the *2019 Refinement*. Certain terms in the definition have been updated based on feedback from the statistics community, such that this definition can be also understood as "a set of procedures intended to ensure that greenhouse gas inventories are accurate in the sense that they are systematically neither over- nor underestimates so far as can be judged, and that they are precise so far as practicable" in the context of refinement of Chapter 3 of Volume 1".

The concept mentioned above should be applied to all species dealt with in this report.

- b. Good Practice covers choice of estimation methods appropriate to national circumstances, quality assurance and quality control at the national level, quantification of uncertainties and data archiving and reporting to promote transparency.
- c. "**Shall**" should not be used. Either say "Good Practice is..." or say what needs to be done or what should be done. These all indicate what needs to be done to comply with Good Practice.
- d. "**Be encouraged to**" indicates a step or activity that will lead to higher quality inventory but are not required for ensuring consistency with the IPCC Guidelines.
- e. "**Recommend**" should not be used. In the GPG2000, the word "recommend" was avoided and "Suggested" was used instead.
- f. "**Inventory agency**" is the body responsible for actually compiling the inventory, perhaps from contributions from a number of other bodies while "**inventory compiler**" is the person actually compiling the inventory,

### Reporting Tables and worksheets

35. Worksheets reflect the application of tier 1 methods only, due to the varied implementation of higher tier methods by countries. Lead authors should stress the importance of documentation and archiving of particular types of information of relevance to each category, although advice may be given of what needs to be reported for transparency at higher Tiers.

### Emission factors and methods

36. Authors should provide default emission factors and parameters. In doing this work, they should draw on the widest possible range of available literature, scientific articles and country reports.
37. All data reported in the guidance as IPCC default values shall be justified by authors by providing TSU with all background data used, and the source of those data, as well as all information on the method applied to derive the default values from the background data, as needed to replicate the calculation, in a timely manner as drafts are being developed. Background data should be compiled in the attached form (Appendix 1) to facilitate the upload in the Emission Factor Database (EFDB). Lead authors should be familiar with the draft cross-cutting guidance on data collection in Volume 1 and the guidance on cross-cutting issues in this note on terms, data types, data demands of methods and stratification requirements. Default data should also meet the EFDB evaluation criteria – robustness, documentation, and applicability<sup>12</sup>.
38. Authors should develop guidance to provide additional information on rationale, references and background information on parameters used for estimating of default values where such information is available (similar to Annexes in Chapter 10, Volume 4, of the *2019 Refinement*), with a view to enhancing the transparency and applicability of default values presented in the new Methodology Report.
39. Single IPCC default emission factors might not be ideal for any one country, but they can be recommended provided that regional factors are unavailable, and the defaults are representative of typical conditions as far as can be determined. It may be necessary or appropriate to provide a range of default emission factors along with clear guidance about how countries should select from within the range. Lead authors may also provide multiple default emission factors, disaggregated by region, technology (including abatement technologies), or another relevant classification scheme.
40. It is important to provide more default emission factors that reflect the unique conditions of developing countries. In general, default emission factors for Tier 1 should represent emissions without category-specific mitigation measures, as well as relevant abatement technologies for which data are available.
41. Users of the guidelines should be encouraged to develop and use country specific data. Emission factors for higher tiers need not be specified in the *2027 IPCC Methodology Report on Inventories for Short-lived Climate Forcers*. Default information is included primarily to provide users with a starting point from which they can develop their own national assumptions and data. Indeed, national assumptions and data are always preferred because the default assumptions and data may not always be appropriate for specific

<sup>12</sup> EFDB evaluation criteria: [https://www.ipcc-nggip.iges.or.jp/EFDB/documents/EFDB\\_criteria.pdf](https://www.ipcc-nggip.iges.or.jp/EFDB/documents/EFDB_criteria.pdf)

national contexts.

42. The basic principle concerning national methods will continue to apply – countries are encouraged to use national data or methods so long as they are consistent with the IPCC Guidelines.
43. Authors shall prefer IPCC methods applied to estimate GHG emissions when those can be straightforwardly applied to estimate SLCF emissions as well as when those can be applied *mutatis mutandis*. The use of consistent methodologies allows inventory-compilers to use the same datasets for both sets of estimates. This is to enhance efficiency in the use of resources available to inventory-compilers and thus to promote accuracy of estimates.
44. Where the method applied for SLCF differs from that applied to estimate GHG emissions from the same source, or the source is not covered in the *2006 IPCC Guidelines*, in addition to methodological guidance, guidance on activity data sources available at international level, and where possible at national level, will be provided.
45. Authors should note the issue of double-counting, for example in the Energy sector the IPCC default method for combustion assumes an Oxidation Factor equal to 1 resulting in all carbon calculated as CO<sub>2</sub>, while the addition of SLCF methods will require to estimate also other carbon compounds (CH<sub>4</sub>, CO, NMVOC and BC/OC). Authors should provide guidance to inventory compilers on how to address the issue of double-counting.
46. For BC/OC emissions, authors should provide guidance, including on techniques of measurement and all variables used to derive emission factors.
47. In considering the methodologies for SLCF emissions in the AFOLU sector, authors should not include natural background emissions from land as these are not considered to be anthropogenic.

### Boxes

48. Consistent with the *2006 IPCC Guidelines*, the new Methodology Report may contain Boxes, which should not be used to provide methodological guidance, but for information purposes or providing examples.

### Decision trees

49. Consistent with the format and structure of the *2006 IPCC Guidelines*, the new Methodology Report may contain a decision tree for some sub-categories to assist countries in selecting from the IPCC methods. These decision trees link the choice of IPCC methods to national circumstances via specific questions about data availability and status as a key category<sup>13</sup>.
50. To ensure consistency in decision tree logic and format across categories, lead authors should adhere to the following requirements:
  - a. The decision trees should be based on a series of questions with clear yes/no answers, and two subsequent branches along yes/no paths.
  - b. The decision trees should start with assessing data availability for the highest tier method, and then direct countries step-wise towards lower tier methods if activity data, emission factors or other parameters are not available.
  - c. The decision tree should indicate the lowest tier method that is judged to be appropriate for estimating emissions from a key category.
  - d. If data are not available for the method referred to in c, the 'No' response should direct the reader to the question "Is this a key category?" If the answer to this is 'Yes', the decision tree should recommend that the country collect the necessary data to implement a higher tier method. If the answer is 'No', then the decision tree can recommend a lower tier method. There is no need to deal with the case for a key source where a country does not have the resources to gather additional data needed to implement higher Tier methods. This is dealt with in Volume 1 of the *2006 IPCC Guidelines*.
  - e. The branches of the decision trees should end in 'out-boxes' that correspond to specific tiers identified in the guidance for that category and are labelled by Tier. Lead authors may also recommend out-boxes for hybrid tiers.
  - f. Lead authors may develop separate decision trees for different sub-categories. Alternatively, they may include decision tree options for selecting different tiers for different sub-categories. This second option is appropriate if it is advantageous to recommend a higher tier method only for significant sub-categories rather than for the entire category. **Decision trees that use the 'significance' criterion must include the "25-30% rule"<sup>14</sup>, as reassessed by authors.**

<sup>13</sup> The most appropriate choice of estimation method (or tier) may also depend on national circumstances, including the availability of resources and advice on this will be given in the cross-cutting volume.

<sup>14</sup> As defined in the *2019 Refinement* (i.e., a significant sub-category is one that makes up more than 25-30% of emissions from a

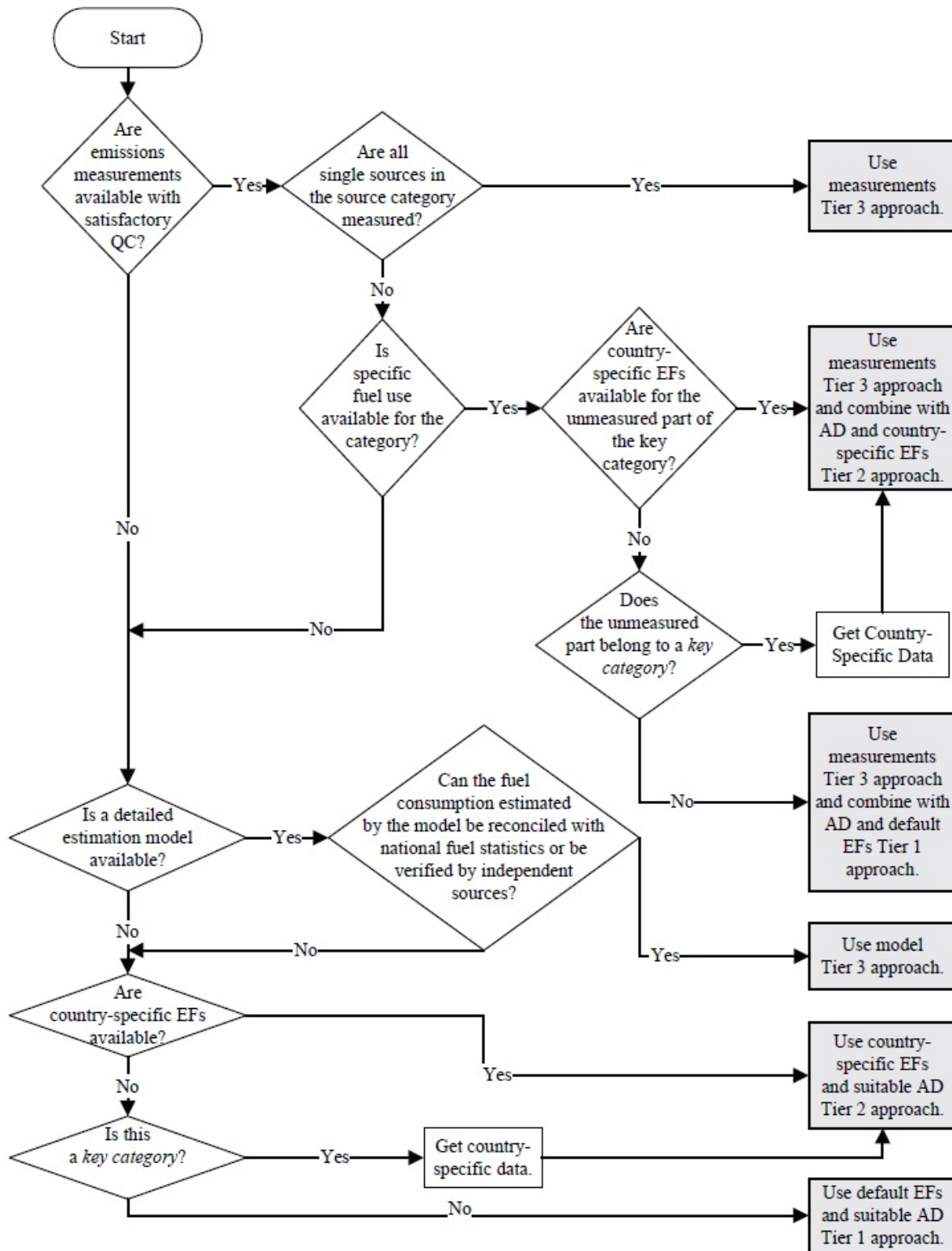


51. Additional Formatting Guidelines (see example):

- a. Decision trees should be drafted in separate files. The TSU will integrate these files into the main text at a later date.
- b. Decision trees should NOT ask the question: "Does this source occur in the country?" This is because decision trees will only be used for sources which occur.
- c. There should be a "START" box.
- d. "Diamonds" should be used for questions/decisions.
- e. "Squares" should be used for all other information.
- f. The out-boxes should be individually numbered.
- g. The text font should be Times New Roman 10pt.
- h. Text should be centred within the boxes.

**Example. Decision tree for estimating emissions from fuel combustion**  
 (Figure 1.2 Chapter 1 Volume 2 of the 2006 IPCC Guidelines)

**Figure 1.2 Generalised decision tree for estimating emissions from fuel combustion**



Note: See Volume 1 Chapter 4, “Methodological Choice and Key Categories” (noting section 4.1.2 on limited resources) for discussion of *key categories* and use of decision trees.

52. SI units shall be used throughout: in text, equations, worksheets and tables. Emissions have to be expressed in mass units and units have to be used consistently within each sector. When similar activity data is used for different sectors same units need to be used (CLAs have to take care about such harmonisation). Conversion factors have to be provided (for example to estimate N<sub>2</sub>O from N). Where input data available may not be in SI units conversions should be provided.
53. Standard abbreviations for units and chemical compounds are given in Appendix 2.

## Appendix 1. EFs and parameters Documentation

This form should be used to document all EFs and parameters used in the new Methodology Report. This gives the minimum information that should be considered by the authors.

Author <sup>1</sup>					
IPCC Category					
Name of EFs / parameters					
Activity, e.g. Fuel <sup>2</sup> in the Energy Sector					
Species <sup>3</sup> :	CO	NOx	...	...	...
Value:					
Unit:					
Uncertainty (as +/-% or 2.5 and 97.5 percentiles ) <sup>4</sup>					
Applicability <sup>5</sup> – fill in as necessary if data not generally applicable. Describe appropriate Technologies, Practices, Abatement Technologies, Region, and/or Regional Conditions					
Source of data (chose one)	Measurement - Scientific Literature Other Measurement National Inventory Report Calculated Based on fuel quality Expert Judgement <sup>6</sup>				
Method of derivation of the value (e.g., arithmetic mean, weighted mean, adjustment of a literature data by expert judgment etc.					
Reference <sup>7</sup>					
URL					
Abstract in English (if the abstract is in another language)					

Note:

1. *The author is the LA/CA/CLA who writes the relevant section and proposes the data.*
2. *Fuels as defined in the Energy volume of the 2027 IPCC Methodology Report on Inventories for Short-lived Climate Forcers*
3. *Add additional species as required*
4. *As defined by cross-cutting volume*
5. *Only to be completed where it is necessary to specify the applicability of the data*
6. *Attach the elicitation protocol*
7. *As reference to document, report, calculation or if expert judgement to those involved (Names or group e.g. "Waste BOG on Solid Waste Disposal Sites") with DOI, where possible*

## Appendix 2. Units and Abbreviations

### *Abbreviations of, and how to spell, chemical species*

BC	Black Carbon
CCl <sub>4</sub>	Carbon tetrachloride
CF <sub>4</sub>	Tetrafluoromethane
C <sub>2</sub> F <sub>6</sub>	Hexafluoroethane
CFCs	Chlorofluorocarbons
CH <sub>4</sub>	Methane
CO	Carbon monoxide
CO <sub>2</sub>	Carbon dioxide
EC	Elemental Carbon
H <sub>2</sub>	Hydrogen
HFCs	Hydrofluorocarbons
NH <sub>3</sub>	Ammonia
NMVOCs	Non-methane volatile organic compounds
NO <sub>x</sub>	Nitrogen oxides
N <sub>2</sub> O	Nitrous oxide <sup>15</sup>
OC	Organic Carbon
PFCs	Perfluorocarbons
PM <sub>x</sub>	Particulate Matter (x – micrometres)
S	Sulphur
SF <sub>6</sub>	Sulphur hexafluoride
SO <sub>2</sub>	Sulphur Dioxide

<sup>15</sup> In the IUPAC N<sub>2</sub>O is officially named “Dinitrogen Oxide”. However, “nitrous oxide” is widely used and understood in the emission inventory community and by the UNFCCC and so, to avoid confusion, will be used.

### **Units and abbreviations**

cubic metre	m <sup>3</sup>
hectare	ha
gram	g
gigagram	Gg
tonne	t
gigatonne	Gt
joule	J
degree Celsius	°C
calorie	cal
year	Yr
capita	Cap
gallon	gal
dry matter	Dm
atmosphere	atm

### **Prefixes and multiplication factors**

<b>Multiplication Factor</b>	<b>Abbreviation</b>	<b>Prefix</b>	<b>Symbol</b>
1 000 000 000 000 000	10 <sup>15</sup>	peta	P
1 000 000 000 000	10 <sup>12</sup>	tera	T
1 000 000 000	10 <sup>9</sup>	giga	G
1 000 000	10 <sup>6</sup>	mega	M
1 000	10 <sup>3</sup>	kilo	k
100	10 <sup>2</sup>	hecto	h
10	10 <sup>1</sup>	deca	da
0.1	10 <sup>-1</sup>	deci	d
0.01	10 <sup>-2</sup>	centi	c
0.001	10 <sup>-3</sup>	milli	m
0.000 001	10 <sup>-6</sup>	micro	μ

**Standard equivalents**

1 tonne of oil equivalent (toe)	$1 \times 10^{10}$ calories
$10^3$ toe	41.868 TJ
1 short ton	0.9072 tonne
1 tonne	1.1023 short tons
1 tonne	1 megagram
1 kilotonne	1 gigagram
1 megatonne	1 teragram
1 gigatonne	1 petagram
1 kilogram	2.2046 lbs
1 hectare	$10^4$ m <sup>2</sup>
1 calorie <sub>IT</sub>	4.1868 joule
1 atmosphere	101.325 kPa

### 2027 IPCC Methodology Report on Inventories for Short-lived Climate Forcers

Date	Action	Comments
February 2024	Scoping Meeting	Prepare ToR, ToC, Workplan and Guidance to authors
February 2024	TFB36 Meeting	Adoption of Outcomes of the Scoping Meeting and Submission to IPCC
3 <sup>rd</sup> quarter 2024	IPCC-61	IPCC Plenary approves ToR, ToC, Workplan and Guidance to authors
3 <sup>rd</sup> quarter 2024	Call for Nomination of Authors and Review Editors	IPCC invites nominations from governments and international organizations
3 <sup>rd</sup> quarter 2024	Establishment of the Steering Committee	TFB select members to join TFI Co-Chairs in the Steering Group ( <i>to ensure consistency across all the volumes and continuity with the earlier IPCC inventory reports</i> )
4 <sup>th</sup> quarter 2024	Selection of Coordinating Lead Authors, Lead Authors and Review Editors	Selection by TFB considering expertise and geographical and gender balance
1 <sup>st</sup> half 2025	1 <sup>st</sup> Lead Author Meetings	LAM1 to develop zero order draft (ZOD)
2 <sup>nd</sup> half 2025	2 <sup>nd</sup> Lead Author Meeting	To develop first order draft (FOD) for review
1 <sup>st</sup> quarter 2026 (8 weeks)	Expert Review	8 weeks review by experts
1 <sup>st</sup> half 2026	Science Meeting	A small meeting of CLAs and some LAs to discuss specific issues that require intensive discussion to reinforce the writing process
1 <sup>st</sup> half 2026	3 <sup>rd</sup> Lead Author Meeting	To consider comments and produce second order draft (SOD) for review
2 <sup>nd</sup> half 2026	Literature cut-off date (one week before SOD Review)	Peer-reviewed papers accepted by the cut-off date (even if not yet published) will be considered. Non-peer-reviewed documents which are made publicly available by the cut-off date.
2 <sup>nd</sup> half 2026 (8 weeks)	Government & Expert Review	8 weeks review by governments and experts
1 <sup>st</sup> half 2027	4 <sup>th</sup> Lead Author Meeting	To consider comments and produce final draft (FD)
1 <sup>st</sup> half 2027	Government Review	Distribute to governments for their consideration prior to approval (at least 4 weeks prior to the Panel)
2 <sup>nd</sup> half 2027	Adoption/acceptance by IPCC	Final draft submitted to IPCC Panel for adoption/acceptance
2 <sup>nd</sup> half 2027	Publication	Electronic means